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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/049,993
Filing Date: April 02,2002
Appellant(s): SLEBODA ET AL.

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For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 08-30-2004.

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/049,993
Filing Date: April 02, 2002
Appellant(s): SLEBODA ET AL.

Thomas W. Saur
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 08/30/2004.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

Concurrent with the present appeal, an appeal has been filed to U.S. application no. 09/382,851, filed August 25,1999 and tiled " VEHICULAR AUDIO SYSTEM AND ELECTROMAGNETIC TRANSDUCER ASSEMBLY FOR USE THEREIN" of which the present application is a continuation-in-part.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

No amendment after final has been filed.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

Appellant's brief includes a statement that claims (1-11), (13-23), (25-45) (Group I) stand or fall together and claim 12 and 24 (Group II) stand or fall together.

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

Warnaka	(US PAT. 6,356,641)	03-12-2002
Clark	(US PAT. 5,754,664)	05-19-1998
Marquiss	(US PAT. 4,385,210)	05-24-1983
House	(US PAT. 5,887,071)	03-24-1999
Watanaabe	(US PAT. 5,450,057)	09-12-1995
Azima	(WO 99/11490)	03-11-1999
Azima	(US PAT. 6,332,029)	

(10) Allowable Subject Matter

Claims 12 and 24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

(11) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

1. Claims 1,9-11,13,15-16, and 35-38, 40-41, 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Warnaka (US PAT 6,356,641) in view of Clark (US PAT 5,754,664).

Regarding claim 1, Warnaka teaches an audio system for use in a vehicle having a roof, the system comprising:

a headliner adapted to be mounted adjacent the roof so as to underlie the roof and shield the roof from view (see fig.1 and 9), the headliner having an upper surface (see fig.9) and a sound-radiating, lower surface (see col.8 line 32 - col.9 line 10);

an array of piezoelectric transducers (see fig.1, (15) obvious to substitute by electromagnetic transducer and see col.11 lines 15-27) assemblies supported at the upper surface of the headliner (see fig.1);

a source of audio signal (see fig.16, (161) and col.10 line 11-50); and the headliner is made of a material which is sufficiently stiff (metal, polymer) and low in density (foam and fabric and see col.col.3 line 55 –col.4 line 15) so that headliner radiates acoustic power into the interior of the vehicle as a single speaker (literally function as a diaphragm in a speaker and see col. 3 line 20-43) , and the signal processing circuitry coupled to the assemblies for processing the audio signals to obtain processed audio signals wherein the assemblies convert the processed audio signals into mechanical motion of corresponding zones of the headliner and radiates acoustic power into the interior of the vehicle (see col.9 line 65-col.10 line 57); but Warnaka does not teach clearly a frequency range defined by a lower limit of 100 hertz or less and an upper limit of 12 kilohertz or more and the processed audio signals at a low end of the

frequency range are matched to the processed audio signals at mid and high ends of the frequency range.

However, Clark teaches a frequency range defined by a lower limit of 100 hertz or less (80 Hz) and an upper limit of 12 kilohertz or more (200 kHz) and the processed audio signals at a low end of the frequency range are matched to the processed audio signals at mid and high ends of the frequency range (see col.4 line 5-67, in particular, lines 39-41).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Warnaka and Clark so as to provide an audio system that provides strong front staging with effective audio imaging in the limited confines of a vehicle interior (Clark, col.2 lines 10-23).

Regarding claims 9-11,13, Clark teaches that the array of electromagnetic transducer assemblies includes a front row of electromagnetic transducer (see fig.1, (18,19,20)) assemblies positioned 5 to 30 inches in front of an expected position of a passenger in the interior of the vehicle and a back row of electromagnetic transducer (see fig.1, (24,29,25,28)) assemblies positioned behind the expected position of the passenger wherein the signal processing circuitry delays (see fig.9) the audio signals coupled to the back row of electromagnetic transducer assemblies relative to the audio signals coupled to the front row of electromagnetic transducer assemblies (see col.8 line44-col.9 line10); and the array of electromagnetic transducer assemblies are completely supported on the upper surface of the headliner (see col.5 line 1-col.6 line 50); and the system is comprising at least one loudspeaker coupled (see fig.1,26,27) to

the signal processing circuitry, and adapted to be placed in the interior of the vehicle in front of an expected position (near front corners) of a passenger and below the headliner; and the system of the electromagnetic transducer assemblies are spaced to the left (see fig.3,(26))and right(27) , front (18,19,20)and rear (28,29) of expected positions of passengers in the interior of the vehicle to create proper audio imaging for the passengers (see col.4 lines 7-67).

Regarding claims 15-16, Clark teaches that the system comprises a low frequency speaker (see fig.4, 28) positioned below the headliner in the interior of the vehicle; and the array has front (see fig.9, (18,19,20)) and rear (24,25,28,29) assemblies and wherein each rear electromagnetic transducer assembly is coupled to processed audio signals delayed in time relative to the processed audio signals coupled to each front electromagnetic transducer assembly (see fig.9 and (col.7 lines 52-54 and col.8 lines 23-56)).

Regarding claims 35-38, Clark teaches that the system of the processed audio signals to be delivered to each electromagnetic transducer assembly may be routed to alternate electromagnetic transducer assemblies to achieve different imaging and performance goals, the processed audio signals being monaural, stereo, or multi channel signals (see fig.9 and (col.7 line 15-col.8 line 56)); and an acoustical center channel signal in a multi-channel setup is achieved by sending a processed center channel signal to both left and the right channel electromagnetic transducer assemblies in a row of electromagnetic transducer assemblies and utilizing mechanical mixing of the headliner to move the headliner between the left and right channel electromagnetic

transducer assemblies as a center channel speaker (see col.6 line 50-col.7 line 9); and the system is comprising a compliant material positioned between the assemblies and the roof (see col.5 line 15-col.6 line 50); and least one microphone positioned in the interior of the vehicle for intra-cabin and extra cabin communications (cellular, digital, etc) (see col.3 line 49-col.4 line 7).

Regarding claims 40-41 and 45, Clark teaches that the system of the signal processing circuitry utilizes adaptive filtering techniques to perform automatic system equalization (see col.7 line 1-col.8 line 42); and each area in the interior of the vehicle can be separately equalized (see fig.9 (equalizers, 130,132,120,122,144,146)); and the system has a frequency response shape wherein the signal processing circuitry changes the shape of an equalization curve applied to the audio signals based on the signal level of the audio signals to maintain the frequency response shape relatively constant as the signal level of the audio signals change (see col.8 line 20-col.10, line 20).

2. Claims 2-4,14,17 and 43, are rejected under 35 U.S.C. 103(a) as being unpatentable over Warnaka (US PAT 6,356,641) in view of Clark (US PAT 5,754,664) as applied to claim 1, and further in view of House (US PAT. 5,887,071 hereinafter House).

Regarding claim 2, Warnaka as modified by Clark differs from claim 2 in not disclosing that the system of the vehicle has a windshield and wherein the array of electromagnetic transducer assemblies includes at least one row of electromagnetic transducer assemblies adjacent the windshield and wherein the at least one row of

electromagnetic transducer assemblies are positioned 5 to 30 inches in front of an expected position of a passenger in the interior of the vehicle.

However, House teaches that a system of the vehicle has a windshield and wherein the array of electromagnetic transducer assemblies includes at least one row of electromagnetic transducer assemblies adjacent the windshield (see fig.2 (44,46)) and wherein the at least one row of electromagnetic transducer assemblies are approximately positioned 5 to 30 inches (see fig.2, (24,26)) in front of an expected position of a passenger in the interior of the vehicle (see fig.3).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Warnaka as modified by Clark with the teaching of House to provide a sound reproduction unit which comprises a central, head receiving portion, and opposite first and second ends having opposed front and back surface.

Regarding claims 3-4, House discloses that the system includes at least one row of electromagnetic transducer assemblies are positioned approximately 12 to 24 inches in front of the expected position of the passenger (see fig.1); and least one row of electromagnetic transducer assemblies includes at least two electromagnetic transducer assemblies spaced apart to correspond to left and right ears of the passenger in the expected position of the passenger (fig.2, (24,26) and see col.2 lines 10-41).

Regarding claims 14,17 and 43, House discloses that the system comprises at least one loudspeaker positioned in front of expected positions (see fig.2, (24,26)) of passengers below the headliner but not in doors, kick panels, or under a dash of the

vehicle; and the audio signals are processed with head-related transfer functions by the signal processing circuitry (see col2 line 27-col.3 line 26); and the audio signals are processed with trans-aural techniques to widen or narrow an image (see col.2 line 10-col.3 line 25).

3. Claims 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Warnaka (US PAT 6,356,641) in view of Clark (US PAT 5,754,664) as applied to claim 1, and further in view of Marquiss (US PAT. 4,385,210 hereinafter Marquiss).

Regarding claim 5, Warnaka as modified by Clark differs from claim 5 in not disclosing that the system of the electromagnetic transducer assemblies includes a magnet for establishing a magnetic field in a gap formed within the assembly, a coil which moves relative to the magnet in response to the processed audio signals, a base fixedly secured to the headliner on the upper surface and electrically connected to the signal processing circuitry and a guide member electrically connected to the coil and removably secured to the base for supporting the coil in the gap and wherein the coils are electrically coupled to the signal processing circuit when the guide members are secured to their corresponding bases.

However, Marquiss teaches that a system of the electromagnetic transducer assemblies includes a magnet for establishing a magnetic field in a gap formed within the assembly, a coil which moves relative to the magnet (see fig.6) in response to the processed audio signals (see col.7 line 13-40), a base fixedly secured to the headliner on the upper surface and electrically connected to the signal processing circuitry (see fig.7) and a guide member (see fig.6, 50) electrically connected to the coil and

removably secured to the base for supporting the coil (see fig.5,29) in the gap and wherein the coils are electrically coupled to the signal processing circuit (see fig.7) when the guide members are secured to their corresponding bases.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Warnaka as modified with the teaching of Marquiss to provide an improved combined stationary coil and moving magnet electromagnetic drive assembly for the lightweight planar diaphragms utilizing state of the art magnetic material having an extremely high energy product.

Regarding claims 6-8, Marquiss teaches that the system of the magnets is a high-energy permanent magnet (see col.6 line 41-col.7 line 25); and the system of the high energy permanent magnets is a rare-earth magnet (see col.6 line41-col.7 line 25); and the system of the assemblies includes a spring element (see col.5 line 61-col.6 line 6) having a resonant frequency below the lower limit of the frequency range when incorporated within its assembly and connected to its corresponding guide member for resiliently supporting its corresponding magnet above the upper surface of the headliner (see col.5 line 40-col.6 line 6).

4. Claims 18-23 and 25-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Warnaka (US PAT 6,356,641) in view of Clark (US PAT 5,754,664) as applied to claim 1, and further in view of Azima (WO 99/11490 hereinafter Azima).

Regarding claim 18, Warnaka and Clark do not teach clearly that the system of the electromagnetic transducer assemblies are supported only on the headliner .

However, Azima teaches that the system of the electromagnetic transducer (see fig.1, 5 (radiator loudspeaker) assemblies are supported only on the headliner (see fig.1 and page 13 lines 6-17).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Warnaka as modified with the teaching of Azima to provide a good radiation pattern for the confined spaces within a vehicle passenger cabin.

Regarding claims 19-23, Azima teaches that the system of the headliner is self supporting (see fig.1); and the system comprises a semi-compliant attachment mechanism adapted to attach the headliner to the roof along at least a substantial periphery of the roof (see page7 line 1-page8 line 10); and a semi-compliant attachment mechanism adapted to attach the headliner to the roof along at least a substantial periphery of the roof and a central portion of the roof (see page 13 line 5- page 14 line 12); and a support structure for reinforcing the headliner (see page 14 line 13-page 15 line 20); and the system is comprising framing independent of the headliner to support the assemblies (see page 5 line 10-page 6 line 25).

Regarding claim 25-29, Azima teaches that the stiffness and density of the headliner material is altered around the entire periphery of the headliner to allow for additional excursion of the entire headliner in order to create better low frequency reproduction (< 200 Hz) of the processed audio signals (see page 4 line 13- page5 line 26); and the system is comprising a fabric or other material adhered to the lower surface of the headliner to create a cosmetically acceptable appearance for the system (see

page 9 line 15-page 11 line 27); and a fabric or other material adhered to the upper surface of the headliner for routing wires over the headliner in order to keep the wires from vibrating when in contact with a vibrating headliner (see page4 line 12-page 6 line 10); and is comprising audio signal wires integrated into the headliner (see fig.3); and a material adhered to the headliner to provide additional mass or damping or stiffness thereby minimizing unwanted excess vibration caused by any resonances in the headliner material (see page 5 line 15-page 6 line 50).

Regarding claims 30-34, Azima teaches that the system comprises fiberglass or other suitable material positioned between the headliner and the roof to minimize undesirable acoustical reflections from the roof, to minimize standing waves set up in a cavity created between the headliner and the roof and to prevent the array of electromagnetic transducer assemblies from engaging the roof (see page 14 line 9 – page 16 line 5); and a electromagnetic transducer assembly for a local sound zone is located approximately between 5" and 30" in front of an expected ear location for a passenger (see fig.1); and least one of the electromagnetic transducer assemblies is adhered directly to the headliner (see fig.3); and each of electromagnetic transducer assemblies includes a subassembly having vibrational characteristics and adapted to be screwed, snapped, or twisted into position at the upper surface of the headliner, and wherein vibrational characteristics of each of the subassemblies can be tested for performance and quality prior to its installation on the headliner (see page 9 line 10-page 11 line 20); and each of the assemblies includes a base fixedly secured to the headliner and removably secured to its corresponding subassembly by a mechanical

attachment and wherein the mechanical attachment also makes electrical contact between the base and its subassembly (see page 9 line 10- page 11 line 20).

5. Claim 39 is rejected under 35 U.S.C. 103(a) as being unpatentable over Warnaka (US PAT 6,356,641) in view of Clark (US PAT 5,754,664) as applied to claim 1, and further in view of Watanabe (US PAT. 5,450,057 hereinafter Watanabe).

Regarding claim 39, Warnaka as modified by Clark differs from claim 39 in not disclosing that the system of the processed audio signals represent global or local vehicle warnings delivered to the entire or local interior sections of the vehicle.

However, Watanabe teaches that a system of the processed audio signals represent global or local vehicle warnings delivered to the entire or local interior sections of the vehicle (see col.1 lines 35-65).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Warnaka as modified by Clark with the teaching of Watanabe to provide an improved stereophonic warning apparatus which is arranged such that a driver of the vehicle with this apparatus can easily distinguish the degree of importance of each of plural objects and rapidly recognize the waning sound with high accuracy according to the motion of the vehicle.

6. Claims 42 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Warnaka (US PAT 6,356,641) as modified by Clark (US PAT 5,754,664) as applied to claim 1, and further in view of Azima (US PAT. 6,332,029).

Regarding claims 42 and 44, Warnaka as modified by Clark does not teach that the headliner has a relatively high coincidence frequency to maximize channel separation,

provide accurate imaging and minimize distortion and wherein the coincidence frequency is greater than 12 KHz ; and the headliner has a structure which is broken at a flexure to minimize transfer of mechanical motion across the flexure.

However, Azima (029) teaches that the headliner (panel elements) has a relatively high coincidence frequency to maximize channel separation, provide accurate imaging and minimize distortion and wherein the coincidence frequency is greater than 12 KHz (see col.16 line 60-col.19 line 40); and the headliner (Young's modulus) has a structure which is broken at a flexure to minimize transfer of mechanical motion across the flexure (col.25 lines 3-65).

Therefore, it would have been obvious to one of ordinary skill in the art the time the invention was made to combine the teaching of Warnaka (641) as modified by Clark (664) with the teaching of Azima (029) to provide practical loudspeaker design, i.e. using available actual materials and values of their relevant parameters, because satisfactory lightweight core materials will generally be of expanded foamed synthetic plastics materials.

(12) Response to Argument

Appellant argued that Warnaka's transducers (15) are piezoelectric elements, not electromagnetic transducers. (brief, page 6, second paragraph). The examiner's response is that in col.11 lines 15-27, Warnaka teaches that such a piezoelectric transducer can be replaced by an electromagnetic transducer, thus meeting the electromagnetic transducer as claimed. In addition, the speakers of Clark include the

type that uses electromagnetic (magnet, see fig.5, 68) transducers (see col.6 lines 26-50). Therefore, both Warnaka and Clark, and their combination, meet the limitation "an array of electromagnetic transducer assemblies supported at the upper surface of the headliner" as recited in claim 1.

Regarding appellant's argument that Warnaka fails to enable other types of transducers (brief, page 6, second paragraph), the examiner respectively disagrees. In Warnaka, the functionality of the piezoelectric transducer assembly 15 is to produce sound from an audio signal, see fig. 15. One of ordinary skill in the art would recognize that the same functionality, ie, producing sound from an audio signal, is achieved with an electromagnetic transducer assembly in place. As such, the electromagnetic transducer of Warnaka when replacing a piezoelectric transducer is enabled.

Regarding appellant's argument that Warnaks fails to teach a frequency range defined by a lower limit of 100 hertz or less and an upper limit of 12 kilohertz or more (brief, page 6, third paragraph), Warnaka is not relied on to teach this feature which is met by Clark who teaches a frequency range defined by a lower limit of 100 hertz or less (80 Hertz) and an upper limit of 12 kilohertz or more (20 kilo Hertz). See Clark, col. 4, lines 39-41.

Appellant argued that the present invention overcomes the deficiencies of Warnaka (brief, page 7, first paragraph). Appellant's invention as claimed is met by the combination of Warnaka and Clark, as detailed in the rejection of claim 1.

Regarding appellant's argument that Clark fails to teach a headliner that radiates acoustic power into the interior of the vehicle (brief, page 8, second paragraph), it is

noted that Clark is not relied on to teach a headliner that radiates acoustic power into the interior of the vehicle which is met by Warnaka, in that Warnaka teaches a headliner that radiates acoustic power into the interior of the vehicle as a single speaker (literally function as a diaphragm in a speaker, col. 3 line 20-43). Further, in Clark, when a speaker is mounted on the headliner and the speakers produces sound, a portion of the sound energy is transferred to the headliner, effectively driving the headliner. In other words, the headliner functions as the speaker's diaphragm which radiates acoustic power / sound energy into the interior of the vehicle. As such, Clark meets a headliner that radiates acoustic power into the interior of the vehicle as claimed.

Regarding appellant's citation of David Macauley (brief, page 8, first paragraph), David Macauley and his teaching are not part of appellant's specification as filed.

Appellant further argued Clark and Warnaka fail to disclose signal processing circuitry (brief, page 8, second paragraph to page 9, second paragraph). The examiner's response is that Clark teaches the signal processing circuitry (see fig.9) coupled to the assemblies for processing the audio signals to obtain processed audio signals wherein the assemblies convert the processed audio signals into mechanical motion of corresponding zones (see col.5 line 15-col.6 line 50) of the headliner and radiates acoustic power into the interior of the vehicle with a frequency range defined by a lower limit of 100 hertz or less and an upper limit of 12 kilohertz or more and the processed audio signals at a low end of the frequency range are matched to the processed audio signals at mid and high ends of the frequency range (see col.4 line 5-67). It is noted that since the speakers are mounted on the headliner, when a speaker

produces sound, a portion of the sound energy is transferred to the headliner in the form of mechanical motion, effectively driving the headliner. In other words, the headliner functions as the speaker's diaphragm which radiates acoustic power / sound energy into the interior of the vehicle. It is further noted that the frequency range defined by a lower limit of 100 hertz or less and an upper limit of 12 kilohertz or more lies within the working frequency ranges of typical speakers, including Clarks (80-20,000 Hz, col. 4, lines 39-41). On the other hand, Warnaka teaches the headliner is made of a material which is sufficiently stiff (metal, polymer) and low in density (foam and fabric, see col.3 line 55 –col.4 line 65) so that the headliner radiates acoustic power into the interior of the vehicle.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning (brief, pages 9-11), it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). In this case, it would be obvious to combine the teachings of Warnaka and Clark because this would provide a audio system which is both easier to install and provides strong front staging with effective audio imaging in the limited confines of a vehicle interior (Clark, col. 2, lines 10-23).

Regarding appellant's argument that Marquiss fails to teach electromagnetic transducer assemblies. (brief, page 11, last paragraph – page 12, second paragraph), the examiner's response is that Marquiss is not relied on to teach the claimed electromagnetic transducer assemblies which is met by Warnaka as modified by Clark, as discussed per claim 1 and first and second paragraphs of this section ("Response to Arguments"). Marquiss is cited to show a structure of a conventional electromagnetic loudspeaker.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Lun-See Lao

Lun-See Lao

Examiner

Art Unit 2643

January, 5, 2005

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